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THE TECHNIQUE OF COLLECTION OF SEMEN AND ARTIFICIAL INSEMINATION IN BOVINES

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In the following article no attempt will be made to discuss the advantages or otherwise likely to result in this country if artificial insemination in cattle were more widely practised. Suffice it to say that in parts of the world, *e.g.* Kenya, the Argentine and Russia, where there is a scarcity of first-class bulls, the wholesale adoption of artificial insemination has been of very real economic importance. Artificial insemination in Great Britain has so far been used chiefly to combat forms of sterility due to anatomical malformation and in certain cases it is of value in preventing the spread of such diseases as contagious abortion and trichomoniasis.

It is essential that veterinary practitioners should be conversant with practical methods of collecting semen and inseminating cows. Also it is frequently necessary to obtain semen so that it can be examined microscopically before an opinion can be expressed concerning the fertility of a particular bull.

COLLECTION OF SEMEN

(*a*) *From Vagina.*—The original method and one which is still commonly used is to collect semen from the vagina of a cow immediately after service. The cow should be free from vaginal discharge or any form of vaginitis. She should be examined by speculum and electric torch to ensure that the vagina is healthy. It is preferable to use a cow with a large vagina and one which has passed the agglutination test for brucellosis. A nymphomaniac free from any disease likely to be spread by coitus can be used. If there is no suitable cow in service it is usually possible to get a bull to serve any cow provided she is restrained in stocks. The latter, however, are only available on a small number of farms. Where a single cow is to be inseminated to overcome sterility due to some anatomical conformation she herself can be used for collecting the semen in the first place.

Before service the lips of the vulva and surrounding skin should be well washed, using water and a brush but no soap because quite small traces of the latter have a marked deleterious effect on spermatozoa. It is advisable to remove as much vaginal secretion as possible as this also interferes with the vitality of the spermatozoa. If the cow is in service this secretion will often assume considerable proportions. It is removed where possible by scooping it out with the hand which is preferably covered with a previously sterilised rubber glove well smeared with sterile liquid paraffin. A rubber glove should always be worn when the hand is likely to come into contact with semen, as minute but potentially harmful traces of soap or disinfectant will adhere to the hand for long periods. Liquid paraffin is the best lubricant. The vagina is then syringed out with sterile physiological saline solution, and any surplus moisture is removed with dry sterile cotton wool swabs; this process is aided by introducing a bladed speculum which is opened so that the blades are applied to the lateral walls of the vagina, leaving the floor exposed. (See Fig. I, *over-leaf*)

The cow is then served. Semen can be collected from the floor of the vagina by making a depression with a finger of the left hand and drawing semen direct from the pit into the inseminator (Fig. II). This method might of necessity have to be adopted when a heifer is used. When the vagina is large enough to allow entry of the hand the semen can be scooped into a dry sterile beaker or tumbler, the bottom of which is covered with sterile liquid paraffin (Fig. III). As a general rule when semen is collected from the vagina the total volume obtained exceeds that collected by other means, due to dilution with vaginal fluids. These fluids are of a mucoid nature and hamper the actual insemination. At the same time this method of collection is liable to produce a contaminated sample. If the bull has not been used for some little time it is preferable to let him serve the cow twice since the first ejaculation is frequently of poor quality, if not completely infertile, and should be discarded.

(*b*) *By Massage.*—A second method of obtaining semen is independent of the female. The lubricated right hand and forearm are inserted in the bull's rectum. First, the seminal vesicles are massaged gently until the watery secretion from the organs is voided. Gentle massage is then applied to the vasa deferentia where they join the urethra. In a number of cases there is at this stage a discharge of a thick milky fluid which contains spermatozoa in an undiluted state. This fluid can be collected in a sterile beaker, held under the prepuce by an assistant. There is no erection of the penis. This method is worth trying in cases where no suitable cow is in service. Unfortunately not all bulls can be stimulated thus to emit semen.

(*c*) *By Artificial Vagina.*—The best method of collecting semen is by means of the artificial vagina. Several patterns are on the market, but the handiest is the Russian model. This consists of a hard rubber or metal tube with a soft rubber lining slightly thicker than the inner tube of a bicycle tyre. Before assembling the artificial vagina the worker must ensure that the hands are clean and dry. The ends of the soft tube

Fig. 1.—Swabbing vagina to remove surplus physiological saline solution before service. Note speculum is opened with blades applied to lateral walls of vagina.

Fig. 1a.—Swabbing vagina.

are turned back on the ends of the outer tube and fixed in position by binding with soft cord. By varying the amount of turnover the tension of the inner tubing can be adjusted. The outer tube has a hole (fitted with a stopper) through which water can be poured into the space between the outer and inner tubes. A graduated glass receptaele fits into one end of the artificial vagina, and the author has had a metal cage fitted to protect the glass (Fig. IV). The inner lining should be adjusted, the stopper removed and the space between outer and inner tubes filled with water at 55° C. from a kettle, the vagina being held in the horizontal position. The stopper is inserted.

Fig. 2.—Semen being drawn into inseminator from pit on floor of vagina.

Fig. 3.—Scooping semen from cow's vagina into sterile tumbler containing liquid paraffin.

A clean dry thermometer is placed in the end of the vagina furthest removed from the stopper. By means of a clean glass rod the whole of the inner surface of the vagina is smeared with sterile vaseline. Some people use liquid paraffin instead of vaseline, but the latter is preferable in practice; 2 to 3 c.c. of sterile liquid paraffin are placed in the glass receptacle before the latter is fitted into position. The thermometer should register a temperature of 42° to 45° C. If the temperature is outside this range one must allow the water to cool or empty out some of the water and replace with hot water from the kettle, to adjust to the required temperature. Finally, the pressure exerted on the lining must be adjusted by holding the vagina in the vertical position with the mouth downwards and

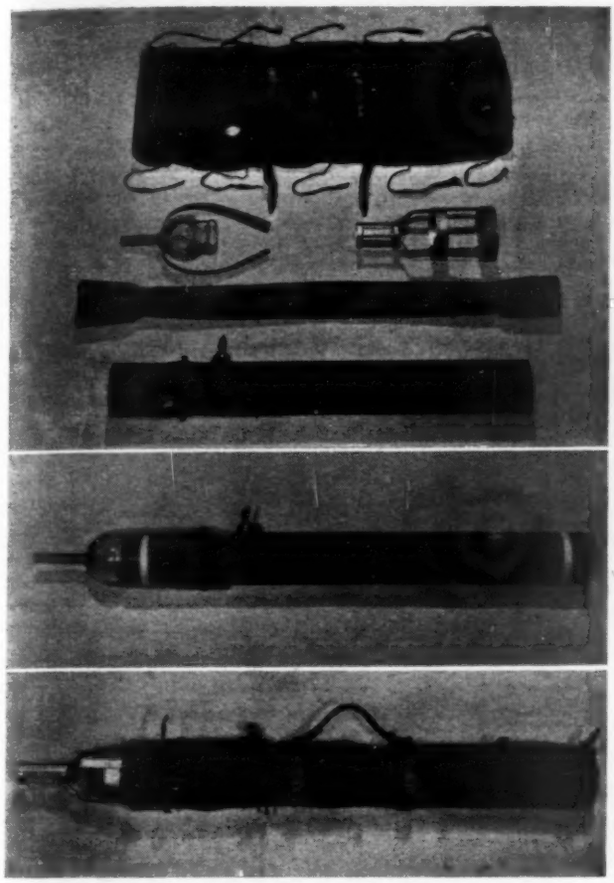

Fig. 4.—Artificial vagina in various stages of assembly.

opening the stopper when any surplus water will run away. The stopper is replaced and the apparatus dried with a clean cloth. A felt jacket with a handle attachment is then fitted around the vagina.

When the apparatus is ready the bull is led to the selected cow. The collector holds the artificial vagina mouth downwards in his right hand and stands on the right side of the cow. When the bull mounts the cow the apparatus is held behind the bull's foreleg and at an angle of 45° with the mouth pointing downwards towards the bull's penis. The penis is directed into the vagina by the operator holding the prepuce with his left hand (Fig. V). Care must be taken not to handle the penis itself as this causes the bull to retract. As soon as the artificial vagina is entered the bull thrusts upwards and ejaculates semen. The artificial vagina should immediately be turned mouth upwards. The semen runs down into the glass receptacle and is covered and protected by the liquid paraffin. The receptacle is removed from the end of the vagina and stood upright in a wooden block. A bull will ejaculate from 2 to 8 c.c. of semen. Many bulls will ejaculate into an artificial vagina if it is held near the flank of a cow which is not in service but which is restrained in stocks.

(*d*) *Other Methods.*—Some workers use a "phantom" cow fitted with an artificial vagina. Whilst this is an excellent method to adopt in bovine clinics which are

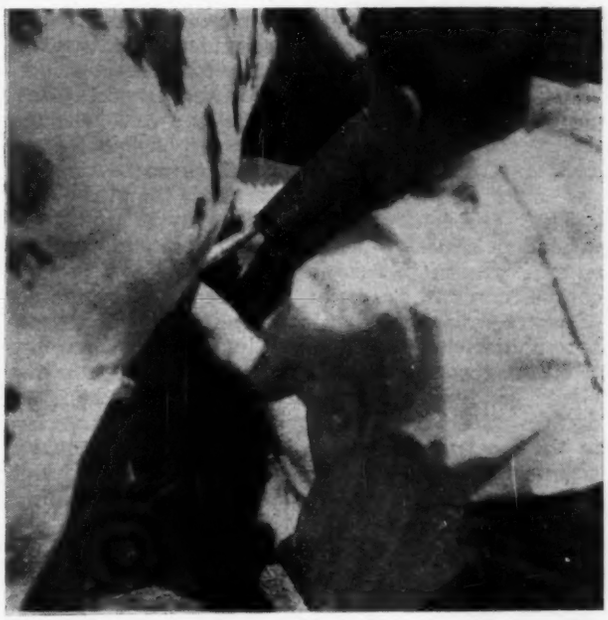

Fig. 5.—Collecting semen by means of artificial vagina. Bull's penis is being directed into the mouth of the A.V. by operator's hand applied to the prepuce.

a feature of veterinary colleges on the Continent, it is obviously quite impracticable for the veterinary practitioner.

Götze in Germany worked with condoms. This method was chiefly used in connection with stallions because difficulty is experienced in getting these animals to serve dummy mares. Little work has been done along these lines with bulls. Götze was handicapped due to his inability to obtain high-class rubber.

A number of Continental workers have utilised the sperm collector which is fitted into the cow's vagina and then held in position by means of a rubber ring which is inflated. Whilst this method is fairly satisfactory there is always a risk of the apparatus slipping out of position, when the bull manages to thrust his penis between the collector and the vaginal wall.

The method whereby a fine sponge is inserted into the vagina before service and afterwards squeezed out into a glass receptacle has been used quite extensively for equines in the past, but it gives a poor specimen of semen. In addition to dilution with vaginal fluids many of the spermatozoa are damaged by the pressure which must of necessity be applied to the sponge. Furthermore, a high proportion of the spermatozoa are retained in the sponge. The sponge itself is difficult to sterilise. There is the added drawback of the small amount of ejaculate in the case of the bull, and this alone renders the method practically useless for bovines.

Special collecting specula which again have been used successfully for mares are of little value in the cow because of the small volume of semen produced by the bull.

Little work on electrical stimulation has yet been carried out on bulls.

Characters of Bovine Semen

Healthy semen is a thick milky suspension, whilst a poor sample appears to be watery. An excessive

yellowish colour denotes the presence of pus. If a drop of fresh semen is examined under the microscope the spermatozoa should be actively motile and individual sperms should be healthy in appearance. Gross changes when they occur indicate to a certain extent the part of the uro-genital tract responsible for the deviation from normal. Abnormalities most commonly encountered are sperms without heads (acephaly), and twisting and looping of the tail. These are due to infrequent service causing prolonged retention of the spermatozoa in the seminal vesicles or to abnormal composition of the accessory secretions. The presence of water causes the heads to split and the tails to become detached. Consequently, care must be taken to ensure that all collecting apparatus is perfectly dry. Giant or dwarf spermatozoa and those which are double-headed or have drops of protoplasm attached to the head result from pathological changes in the germinal tissue. Some abnormal sperms will be found in most good samples of semen but abnormalities should be few in a good breeding bull.

The semen must be free from virus, bacteria or protozoa likely to give rise to vaginitis or metritis in the cow, *e.g. Brucella abortus*, streptococci, *C. pyogenes*, *Vibrio foetus*, *M. tuberculosis*, trichomonads, etc. It should be pointed out that in most cases the presence of these organisms results in a reduction in the number and in abnormalities of spermatozoa. The organisms may have originated in the testicles where their presence may have interfered with spermatogenesis. They may have originated from the seminal vesicles, and here or elsewhere in the genital tract, bacterial products will reduce motility, etc., of the spermatozoa.

By means of the haemocytometer the number of spermatozoa present can be estimated; they should average about 800,000 per c.c.

The sooner after collection semen is used for insemination the better and without special provision for storage it should be used within half an hour. Semen when voided contains oxygen and carbon dioxide, and if the fluid is exposed to the air there is an interchange of gases, with the result that the correct balance is upset to the detriment of the spermatozoa. Hence the precaution of covering the semen with a layer of liquid paraffin. Spermatozoa prefer an alkaline rather than an acid medium. Semen should be protected from direct sunlight, wind, rain, etc. Diffused light is not particularly harmful to the sperms whereas direct sunlight kills them in 20 minutes. Sudden changes of temperature produce fatal shocks, thus when semen is being prepared for storage it must be cooled gradually. The heavy metals have a deleterious effect on spermatozoa when they come into contact with them. If semen is maintained at or near blood heat the spermatozoa remain actively motile for a time then rapidly lose their motility and die. If the semen is cooled the sperms conserve their energy and regain their motility when the temperature rises. The secretions of the accessory glands stimulate expenditure of sperm energy. Walton has shown that if spermatozoa are separated by centrifuging from the seminal fluids and stored separately the time of survival can be increased.

If the semen is to be stored or transported it is pipetted into a small tube. Any space above the semen is filled with liquid paraffin and a rubber stopper is inserted. The tube is surrounded with cotton wool and placed in a tightly-stoppered container which is immersed for a time in water cooled by adding ice. Finally, the container is placed in a thermos flask containing chipped ice. In this way the semen can be transported. If necessary the flask can be packed in a box containing wood shavings or cotton wool or it can be wrapped in several layers of corrugated cardboard. When required, the container is removed from the thermos flask and allowed to stand for half an hour at room temperature, so that there is a gradual rise of temperature. The tube containing the semen is then removed. Bull semen can be successfully kept for 72 hours.

Insemination

The semen can be used as obtained or can be diluted. Whether dilution is practised or not depends on the number of cows to be inseminated from the semen of one bull.

Küst has reported satisfactory results when using physiological saline as a diluent. This, however, has not been the general experience of other workers. Various diluting fluids are used and these can either be made up by the practitioner or purchased from surgical instrument manufacturers. Buying the prepared fluid will probably suit most practitioners better. The author uses the diluting fluids given by Hammond in 1936 which are as follows:—

Solution 1

Anhydrous glucose ...	5·7 grammes.
Distilled water	100 c.c.

Solution 2

Crystalline sodium acid phosphate	34·1 grammes.
Potassium acid phosphate	1·4 ,,
Calcium acid phosphate ...	0·1 ,,
Magnesium acid phosphate	0·1 ,,
Sodium sulphate	1·7 ,,
Peptone (salt free) water...	1,000 c.c.

Solution 2 is made up, sterilised and sealed in glass tubes each containing 10 c.c. Small quantities of solution 1 are made up as required, care being taken to avoid contamination. The top of the tube containing solution 2 is removed and equal quantities of solutions 1 and 2 are mixed immediately before use. The semen is diluted with an equal volume of this combined diluting fluid.

Insemination should be carried out whilst the cow is in service or during the eight hours following oestrus. The percentage of successful inseminations is increased where the procedure is repeated once or even twice during the 24 hours following oestrus. In connection with sterility due to delayed ovulation it is necessary to inseminate when the Graäfian follicle is ripe and this in certain cases can be as much as five days after oestrus. This subject, however, will be discussed in a later article.

There are several patterns of inseminator in common use. They can be made entirely of glass; can have a glass barrel and asbestos plunger, the barrel being encased in metal; or they can consist of a glass barrel and plunger to which is attached a vulcanite nozzle. The author prefers the all-glass inseminator because it is easily cleaned and sterilised and because contact with metals is injurious to spermatozoa. Many people are nervous about using an unprotected glass instrument in the cow's vagina. The type with the glass barrel and asbestos plunger is the one most frequently employed in this country (Fig. VI).

Fig. 6.—Inseminating. Note speculum opened with blades applied to roof and floor of vagina.

The makers usually supply spare asbestos rings which are readily fitted. One cubic centimetre of sterile liquid paraffin should be drawn up into the inseminator. This protects the spermatozoa against any metal, *e.g.* the stud holding the asbestos plunger in position, and at the same time effects economy in semen. All patterns of inseminator do not eject all the semen drawn up, consequently more than the quantity of semen required for the cow must be taken into the inseminator. If liquid paraffin is first drawn up all the semen is expelled and the residual fluid consists of liquid paraffin. The author wishes to acknowledge the fact that he adopted this practice as a result of advice he received from Professor Wm. C. Miller. The optimum amount of semen, diluted or otherwise, necessary to inseminate a cow is 0·5 c.c. Larger doses tend to cause straining and consequent ejection of semen from the cervical canal.

The receptacle containing the semen is well shaken and the necessary semen is taken up into the inseminator which already contains liquid paraffin.

The lips of the vulva and surrounding skin are thoroughly washed, using a nail brush and plain water. A speculum is inserted into the vagina—the tubular and the Russian are the best patterns to use for insemination. This is held in position with the left hand. The vagina is illuminated with an electric torch fitted to the speculum or a forehead lamp. Holding the inseminator in the right hand the nozzle is introduced to the extent of 1 or 2 cm. into the cervical canal, and the semen ejected by pushing home the plunger. The inseminator and speculum are withdrawn and if the cow shows a tendency to strain she is walked about for a few minutes, failing which the back is pinched. The inseminator is sterilised after use on each cow by washing out with sterile physiological saline solution, followed by 65 per cent. alcohol which in turn is followed by more saline.

It is perhaps superfluous to add that if insemination is practised in a herd where contagious abortion is being controlled by blood testing and segregation of reactors, brucella-free cows must be inseminated before proceeding to the reactors.

When insemination is completed particular attention must be paid to the cleaning and sterilising of the artificial vagina and inseminator. The former is taken to pieces, the inner tube is turned inside out and vaseline is removed by scrubbing with a hot 2 per cent. solution of washing soda. It is then rinsed thoroughly and wiped all over with a cotton wool swab soaked in 65 per cent. alcohol and allowed to dry. The glass receptacle is washed in hot water containing 2 per cent. washing soda, rinsed and wiped out with 65 per cent. alcohol.

The inseminator is first cleaned by drawing up and expelling warm water. It is then dismantled and sterilised by boiling. It is allowed to dry thoroughly before being reassembled.

Summary

(1) Semen is collected both for the purpose of artificial insemination and for the purpose of ascertaining whether or not the bull is fertile.

(2) There are several methods of obtaining semen, the best undoubtedly being by means of the artificial vagina.

(3) Spermatozoa are extremely susceptible to environment and great care must be exercised to prevent contact with deleterious materials, direct sunlight and wind, and to prevent the interchange of gases.

(4) Insemination should be carried out as soon as possible after the semen has been obtained.

(5) Apart from very special cases of sterility, the first insemination should be performed within eight hours of oestrus.

(6) Precautions must be taken to prevent the spread of disease from infected to healthy cows.

Acknowledgment.—I desire to express my indebtedness to my colleague, Dr. R. Carrick, for the photographs with which this contribution is illustrated.

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An inter-departmental committee has been set up to secure greater liaison between the activities of the Ministry of Supply, which is responsible for the salvage campaign, and other Services and Departments.

Mr. R. C. Morrison, Labour M.P. for North Tottenham, is to be Chairman of the new committee, on which will be represented the following Ministries: Admiralty, War Office, Air, Scottish Office, Health, Supply, Agriculture, Food, Aircraft Production, and the Messing By-products Advisory Committee.

ABSTRACTS

[RESEARCHES INTO STERILITY OF COWS IN SOUTH AFRICA. THE INFLUENCE OF: (i) DRY RATIONS AND (ii) LACK OF EXERCISE ON SEXUAL MATURITY AND THE DURATION OF THE OVARIAN CYCLE IN BEEF HEIFERS. Quinlan, J., Roux, L. L., and van Aswegan, W. G. (1939.) *Onderstepoort J.* **12.** 233-249.]

Recorded observations by various authorities indicate that there is great variation in the age at which the first oestrus occurs in cattle. There can be little doubt that such variation may be attributed to nutritional and genetic factors. For European cattle the age of puberty for all breeds under normal conditions of feeding is about nine months, but it may vary from five to fifteen months (Hammond, 1927). South African breeders state that Afrikander heifers, under ranching conditions of "free-breeding," rarely calve before three to three-and-a-half years of age. Quinlan and Roux, 1936, reported that high-grade Sussex × Afrikander heifers fed on dry rations reached sexual maturity between 16 and 23 months, with an average of approximately 19·5 months.

In the present investigation it is recorded that in 28 Sussex × Afrikander heifers, maintained in an artificial environment enforcing dry rations and restricted exercise, the average age at the appearance of the first oestrus was 528·5 days (75½ weeks). Sixteen heifers born during the warm season showed oestrus for the first time at an average age of 553 days, while twelve born during the cold season showed the first oestrus at an average age of 496 days. There was a striking difference in the age of sexual maturity of the heifers born in different years, *e.g.*, 664 days for heifers born in 1933, and 322 days for heifers born in 1931. This difference cannot be explained as all the heifers were kept under similar conditions. The average age of sexual maturity was, as a rule, much greater than that recorded in Europe and America, but the figures given here should be accepted with reserve, as also should those given by Quinlan and Roux, 1936, since the enforced environment was artificial and may have delayed the onset of sexual maturity. The average length of the dioestrous cycle recorded for the heifers in the present investigation was 20·3 days, a figure which appears to conform with that recorded in Europe and America.

N. J. S.

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[INFECTION AND RE-INFECTION EXPERIMENTS WITH BANG'S DISEASE. Edgington, B. H., and Donham, C. R. (1939.) *J. Agr. Res.* **59.** 609-613. (6 tables.).]

The experiments reported in this paper are concerned with: (1) The effect of time of breeding and stage of gestation on the agglutination and clinical response of six groups of animals exposed to *Brucella abortus* infection; (2) the channels of entrance of the bacteria into the animal body; and (3) the effects of re-infection as distinct from a single initial infection. The experimental procedure is fully explained.

The experiments recorded appear to confirm the view generally held that cows infected with Bang's disease usually abort but once or twice and thereafter carry their calves to full time. They strengthen the opinion that cows which become infected when they are in a non-pregnant state are not likely to abort their next calves and may never abort. The results of the experiment tend to show that it is not the method of administration nor the channel of entrance of *Br. abortus*, but rather the "status" of the animal at the time of exposure that determines what will happen as far as the act of abortion is concerned. The experiments show that it is relatively easy to infect the female bovine experimentally by placing a suspension of virulent *Br. abortus* into the vagina, and that infection through this channel produces effects essentially the same as when infection enters the body through other avenues.

In these experiments the re-infection of heifers exposed to infection prior to pregnancy did not appear to cause definite alterations in the agglutination content of the blood, nor significantly interfere with the animals' capacity to carry their calves to maturity, but it is admitted that "intermittent or continuous exposure occurring at various intervals before breeding might affect the outcome of pregnancy." The authors state, "If the problems concerned with this disease consisted only in preventing abortions, which is certainly not the case, its solution would be relatively simple since these and other experiments have shown that it is possible to control this symptom to a considerable degree by exposing animals at a proper time."

L. E. W. B.

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[A MILD EPIDEMIC OF UNDULANT FEVER IN A BOYS' SCHOOL DUE TO DRINKING RAW MILK. Elkington, G. W., Wilson, G. S., Taylor, Joan, and Fulton, F. (1940.) *Brit. Med. J.* March 23rd. 477-479. (1 table, 5 refs.).]

An account of an outbreak in a school of 400 boys' where the consumption of raw infected milk led to the occurrence of two definite clinical cases of undulant fever, as well as a number of sub-clinical cases, and a large number of latent infections involving 30 per cent. of the boys. Every boy was given a glass of milk daily, and the source of supply had that term been changed from tuberculin-tested to raw ungraded milk. The two definite cases occurred three to five weeks after the beginning of term and within a period of three to seven weeks; 26 other boys suffered transient illness characterised by mild fever, headache, malaise, listlessness and more rarely abdominal pain, sore throat, nocturnal sweating or urticarial rash.

On examination, ten of these boys revealed serum agglutinins to *Br. abortus* in titres of 1/20 to 1/1,100. A further examination of the blood of 17 boys showing no clinical symptoms revealed five with serum agglutinins to a titre of 1/20 to 1/1,100. While on general grounds it is probable that some of the sore throats and abdominal pains were due to causes other than *Br. abortus* and that the presence of agglutinins in low titre may have no significance, it was obvious that the distribution of agglutinins in the school was not normal.

The source of milk supply was investigated and the presence of *Br. abortus* was confirmed. Following a change to pasteurised milk, after three weeks, no further cases occurred.

A. E. K.

[DURATION OF IMMUNITY INDUCED IN CALVES BY B C G. II.—RESISTANCE INDUCED BY MULTIPLE DOSES OF THE VACCINE. Buxton, J. B., Glover, R. E., Dalling, T., and Bosworth, T. J. (1939.) *J. comp. Path.* **52**. 273.]

The present article represents the final stage in the investigations into the efficacy of B C G vaccine for cattle maintained under laboratory conditions and follows a preliminary report on the relative merits of various routes of administering the vaccine in evoking a resistance to the intravenous inoculation of bovine tubercle bacilli (*Lancet*, 220, p. 393). The results of the previous experiments were disappointing in that a complete protection of every calf was not secured although the lesions in the vaccinated animals as compared with the controls were appreciably restricted in their extent. It seemed desirable, therefore, to ascertain the duration of immunity induced in calves by repeated doses of B C G given at six-monthly intervals, and determine whether any material immunity would occur in older animals exposed to a fairly continuous infection over a longer period than in the preceding series.

The experiments now described are grouped into three sections. They comprise (*a*) cattle vaccinated with B C G every six months for a period of three years kept under conditions of rigid isolation from exposure to tuberculous infection, and finally infected with a single dose of virulent tubercle bacilli given by the mouth; (*b*) cattle vaccinated with B C G every six months and exposed to multiple infection with virulent bovine tubercle bacilli by the mouth shortly after the first vaccine, the infective dose being repeated at intervals; and (*c*) cattle vaccinated with B C G every six months, isolated for a period of 18 months and then exposed to infection as group (*b*).

The reaction of vaccinated animals to tuberculin has also been considered in some detail, the observations made being in conformity with modern views on allergy and immunity to the effect that the extent of the resistance against tuberculosis which is exhibited by vaccinated animals is quite independent of the sensitivity to tuberculin.

It would be impossible in this abstract to do justice to this comprehensive series of experiments or to deal adequately with the discussion arising from them. Those interested, therefore, are advised to consult the original. All that can be attempted in the space available is to reproduce *in toto* the conclusions arrived at, namely :—

1. B C G given intravenously at six-monthly intervals in doses of 50 or 100 mg. is well tolerated by cattle.

2. Of eight calves which had been vaccinated regularly at six-monthly intervals for a period of three years, five (62 per cent.) were completely resistant to an oral administration of virulent tubercle bacilli which produced extensive local and slight generalised tuberculosis in unprotected controls. In the remaining three (38 per cent.) no macroscopic lesions were found in one, while in two the tuberculous changes were slight.

3. The resistance induced by the repeated inoculation of B C G over a period of three years was overcome by continued exposure to infection immediately after the first dose of vaccine or after a lapse of 18 months. Of 28 animals, ten were completely free from tuberculosis (35·5 per cent.), 14 showed slight or moderate lesions (50 per cent.), while four were severely affected (14·5 per cent.).

4. Distinct fluctuations in the sensitivity to tuberculin were observed during the course of vaccination with B C G. In general, each reinforcing dose tended to augment the skin sensitivity, but the stimulus was less apparent with successive doses of the vaccine.

5. In a proportion of vaccinated animals, which showed no visible lesions at *post-mortem*, virulent organisms were obtained from various lymphatic glands by guinea-pig inoculation.

L. E. W. B.

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[THE SKIN LESIONS OF BOVINE TUBERCULIN REACTORS. (Second Report.) Hole, N. H., and Hulse, E. C. (1939.) *J. comp. Path.* **52**. 201.]

A preliminary report on this subject was published by Robertson and Hole in 1937 (*J. comp. Path.*, **50**, 39-57). A further investigation of skin lesions in 30 cattle has now been completed.

The majority of lesions were found on the forelegs, although occasionally lesions were observed on the hind legs and elsewhere. On the fore legs the lesions generally followed the line of the superficial lymphatic vessels and they appeared as a chain of nodules extending from the shoulder-joint to the carpus. Three distinct types of lesion were observed: (1) nodules showing small foci of necrosis; (2) subcutaneous nodules with a tough capsule enclosing dry, necrotic material; (3) an abscess type containing soft, creamy pus. Lesions of an adjacent lymphatic gland were observed in one instance.

Positive reactions to avian or bovine tuberculins were recorded in many skin lesion cases which showed no other lesions (*post-mortem* and biological examinations). Co-existent tuberculosis was seen in four cases only. Attempts to cultivate a causal organism from the lesions and to transmit the condition by animal inoculation failed completely. Avian and bovine tubercle bacilli and *M. phlei* were employed for experimental intradermal and subcutaneous inoculations in cattle. Solitary nodules simulating "skin lesions" were obtained, but the typical chains of lesions could not be produced. The histology of both natural and experimental skin lesions is described.

E. C. H.

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[THE USE OF "TUFFON" IN VETERINARY SURGERY: THE ARREST OF HAEMORRHAGE AND WOUND TREATMENT. Wenzel, E. (1939.) *Tierärztl. Wschr.* **45**. 714-718.]

A notable advance in the treatment of bleeding, particularly oozing, wounds seems to have been made with the use of "Tuffon," which is said to be prepared from a kind of vetch plant.

It is sold in the form of a brown, finely granular powder, which on the addition of water or aqueous solutions, swells up about 15-fold and gelifies. It also adheres as a thick scab to moist surfaces. These properties make it a very valuable haemostatic agent for operative or accidental wounds which are not cavernous. "Tuffon" swells so much that it increases the size of wound cavities; it is, therefore, contra-indicated for such. It is non-irritant and is best used in the first wound dressing as it stays in close contact during the usual period that such a dressing is left in position.

Many case records from human and animal surgery are given.

J. E.

REVIEW

[**THE PRINCIPLES OF PARASITE CONTROL.** Cameron, T. W. M. (1940.) National Business Publications, Ltd., Gardenvale, Quebec, Canada. 48 pp., 3 diagrams. Price: 50 cents in Canada, 2s. 6d. in Great Britain.]

As Professor Cameron points out in his Preface, the subject matter of this publication represents the substance of three lectures delivered under the auspices of the University of London at the Royal Veterinary College, London, in September, 1938. With the exception of the diagrams, the textual matter was originally published as five separate articles in the *Canadian Journal of Comparative Medicine*, Volume 3, Parts 7-11, 1939.

The author makes it clear that his remarks on control deal with principles, which are universal in their scope, rather than with detailed instructions for their local application. Following a brief introduction, in which Professor Cameron gives an explanation of what is meant by parasitism, there is an interesting discussion on the importance of parasites. Here the author shows that although parasitism is universal, parasitic disease is not, that parasitism is a very serious source of loss to stock owners and that, in general, parasitic diseases depend upon the density of distribution of the animal population, including reservoir hosts. Where this animal population is dense, disease is likely; this occurs mainly in sub-tropical and temperate climates. Although parasites are not uniformly distributed throughout the world, some of the most important forms are almost universal, and the author points out that the most important single factor governing distribution of internal parasites is climate, although other factors such as soil, intermediate hosts, reservoir hosts, etc., also apply.

In the succeeding section Cameron discusses four sets of factors necessary for the successful development of parasites in a host. These are: (1) successful admission to the host; (2) suitable environmental conditions in the host; (3) possession of a suitable protective mechanism against the normal metabolic processes of the host, and (4) absence of a host reaction that would interfere with the normal metabolism of the parasite. The presence or absence of these factors, individually or collectively, may give rise to various states of host-parasite relationship such as compatibility or incompatibility, tolerance or intolerance, premunition and natural or acquired resistance. In the last case both kinds of resistance may be virtual, absolute or partial.

Turning next to the control of parasites, Cameron points out that this consists in making their development as difficult as possible. This depends essentially on a knowledge of the life history and bionomics of the parasite involved. In determining control methods the economic aspects of the problem have also to be considered.

The author shows that a parasite may be attacked at one or other of the various stages in its life-cycle and proceeds to deal with the appropriate control measures that may be undertaken. Thus, there are various methods of destroying the eggs or pre-infective larvae of parasites passed in the faeces. The manure can be subjected to special treatment such as storage, manipulation of one kind or another to utilise the lethal effect of the natural heat of fermentation, steam sterilisation, natural drying which is only feasible in hot, dry climates, or chemical treatment. The results of the addition of a chemical to faeces depend not only on the composition but also on the quantity of the chemical used. It may increase the percentage of larvae which reach the infective stage and survive or there may be no effect at all on eggs or larvae. The larvae may still reach the infective stage and then exsheath without being killed immediately thereafter or, after reaching the infective stage, they may be killed or only a few larvae may survive. Finally all eggs or free-feeding larvae may be killed rapidly. Professor Cameron considers it probable that the thickness of the larval sheath may be an important factor in preventing the action of some chemicals on the larvae. Some chemicals can be used as gases although some of the most efficient are dangerous or, at any rate, unpleasant to use. In addition to considerations of effectiveness and ease of application, cost is a controlling factor in the use of chemicals and crude chemicals may contain impurities which may alter their lethal value or act as plant poisons and thus render the manure unsuitable as a fertilising agent. Interposed here is a list of about 100 chemicals, which have been tested on infected horse faeces at the Institute of Parasitology, Macdonald College, Quebec, together with the approximate percentages found necessary to cause reasonably efficient sterilisation; 14 substances, of no value, are also named.

Under the heading of "Manure distribution," the author discusses the value of selective disposal, ploughing-in, and fly destruction because some insects not only act as vectors, either as mechanical carriers or as intermediate hosts, of certain worms but also have a public health importance in connection with bacterial diseases which they may disseminate. For those eggs and larvae which do not normally leave the host in the faeces, such as in *Oxyuris*, *Trichinella*, kidneyworms and microfilariae, other control methods are necessary.

Professor Cameron then goes on to discuss methods of destroying infective larvae either free or enclosed in egg shells under the following heads: (i) Disinfection —(*a*) chemical, (*b*) heat, (*c*) cleanliness; (ii) Pasture treatment by chemicals, by collection of droppings, by the spreading and harrowing of faeces so as to expose larvae to physical agents which tend to shorten their life, by the burning of grass and by drainage, by making use of climatic factors such as cold and sunlight through suitable methods of animal husbandry. Although some dung-feeding insects destroy many worm eggs, others may act as vectors or as distributors rather than destroyers. Mixed grazing is often of great value in reducing the infectivity of a pasture; haying or removing turf and resowing will bring about the mechanical removal of infective material.

The author passes to a discussion of the measures applicable in the avoidance of infection of the host and prevention of ingress of the parasite. In brief, these consist in general hygiene, disinfection, the avoidance rather than the use of permanent pastures, pasture rotation, the use of bare lots, fencing, avoidance of overstocking, night housing, raised troughs for food and water, use of silage and folding, cooking of food given to fish- and flesh-eating animals, use of floor boards, wire or concrete floors for pigs, carnivores and poultry to eliminate auto-infection, nose-ringing of pigs, and quarantine of new stock.

As all nematodes, cestodes and some roundworms of

domesticated animals require essential intermediate hosts which may be crustaceans, arachnids, insects, earthworms, snails and slugs, or vertebrates such as fish, amphibia and even other mammals, measures against the vectors must be undertaken, and Professor Cameron makes some interesting comments on methods for their control. Destruction of the parasite within the final host may be carried out by the use of suitable drugs and the advantages of mass treatment under strict veterinary supervision over individual treatment are emphasised. No less important is the control, so far as is practicable, of wild animals which act as reservoirs of infection for domesticated ones. Where effective control of a parasite, which would eliminate the disease caused by it, cannot be carried out, some steps can be taken to reduce or avoid the disease. In this connection the provision of preventive licks and of a sufficient, well-balanced diet is important.

In his concluding paragraphs, Professor Cameron takes care to state that the principles he has been discussing are general ones, that they represent the broad outlines of prevention which must be applied with discretion and must vary with circumstances.

IN PARLIAMENT

Bovine Tuberculosis

In the debate on the second reading of the Agriculture (Miscellaneous War Provisions) (No. 2) Bill [House of Commons, August 1st], Mr. John Morgan said that the Minister of Agriculture (Mr. R. S. Hudson) had included references to the maintenance of grants for the eradication of bovine tuberculosis. He had stated in the Memorandum that it was not unreasonable to suppose that future expenditure will be somewhat less during the war period. "Why is it going to be less during the war period?" asked Mr. Morgan, who continued: "I should have thought there was a danger of the cattle being underfed during the war period, and that constitutional weaknesses are likely to be brought out as a result. A figure of £773,000 is to be spent on this work. It makes one feel that if Ministries can advance such a sum for eliminating cattle disease—and to capitalise that expenditure as an annual expenditure it represents an enormous amount—then it seems that some very positive, sustained and actual approach should be made to this problem rather than annual allowances for clearing up a disease which seems to be so persistent."

Mr. David Adams said that there was a part of the Bill—Clause 3—in which the urban dwellers of the country are particularly interested. "The new cheap milk scheme will cause a greatly increased consumption of milk in the country, and it is therefore of vital importance to the State that the quality of the milk produced should be of an unassailable character," proceeded the hon. Member. "No one disputes that tuberculosis in cattle is a cause of tuberculosis in human beings, and all sections of the community are affected by this and other diseases due to tuberculous cattle and their products. One has merely to look at the annual report of the Ministry of Health to realise how serious is the problem of tuberculosis.

"Milk is not perhaps the prime factor in tuberculosis, but it certainly plays a part, and perhaps a leading part, in connection with it. Everyone will agree that the prevalence of this and kindred diseases is of vast cost to the State, and therefore all sections of the community are interested, and particularly the local authorities, which expend vast sums annually in combating what has been described as one of the great killing diseases. The State makes contributions to the local authorities, and private individuals suffer loss and disabilities from this disease, and if any steps can be taken to increase the protection of the community against the disease, they certainly ought to be taken. It is an interesting fact that, in spite of what is suggested in Clause 3, the continuing of an expenditure of some £773,000 per annum upon improving the quality of the herds in the matter of bovine tuberculosis which in the 7½ years perhaps will reach some £5,750,000, the Milk Marketing Board advise us that they are putting upon the market all this non-designated milk which any medical officer of health in the country will tell us is in the main tainted by excremental pollution on the one hand, and by various disease germs on the other, and that it is a definite source of injury to the community and ought to be dealt with. The Ministry of Health, which has been approached by medical officers of health, has expressed the fear that in the war period this difficulty cannot be dealt with, and when it was raised recently in a question, it was stated that the Ministry of Food had the matter under consideration but that it was not very hopeful of dealing with it. Some 50 per cent. of the non-designated milk is dealt with by the large distributing agencies and is pasteurised, and it is therefore safe, or relatively safe—though much depends upon the bottling process—for consumption by the community, but that still leaves at least 25 per cent. of the milk consumed in this country which, under a proper and commonsense state of society, would not be permitted to be marketed in any way in its raw state.

I do not know of any section of the community which is similarly privileged as is undoubtedly this side of agriculture. It is permitted by the State and the various Ministries concerned, and in contradiction to the general interests of the community, to place an unwholesome and a dangerous food upon the market for human consumption. What other industry, trade or business is permitted to do that? No other section of agriculture could do so. Prosecutions would immediately ensue, but it is not so in the case of milk which is impure. My hon. Friend the Member for Doncaster (Mr. J. Morgan) made reference to Clause 3 of the Bill, and I am glad that he did so, as he was a practical farmer. He had asked what progress had been made in this matter, because he realised the great seriousness of the situation. I should like to know, if the Minister could tell us, the position with regard to the attested herds of the country? Is he pursuing a course which is really fruitful in the matter, or is there any continuation of the amount of tuberculosis in cattle that we have seen for years past?

"It is significant that medical science tells us that tuberculosis is a disease attributable to three main causes—bad housing, a low standard of living, and improper food, in which one must include milk. We have almost solved our housing problem, and we are grateful to the Government for what has been done, and the standard of life has been raised in this country during the last few years, but still there remains this terrible drain upon the country from this source of tuberculosis. One dare not care to say that the large sum of money which has been expended, and which it is proposed to expend—£5,750,000 in the course of the next 7½ years—is wasted money, and it is also significant to remember too that over £2,000,000 sterling was expended in 1939, and a similar sum will be expended this year, in producing a better quality of milk for the consumers of the country and yet we have an almost stationary position with regard to tuberculosis in this country.

"What is the prime cause from which we are suffering? I do not believe it is through the great herds of this country; certainly it cannot be through the attested herds, but I believe it is through the hundreds of small farmers —many with only 15 to 20 cows—who are suffering from poverty and have not sufficient resources to obtain the necessary credit. They cannot avail themselves of the monetary efforts made by the Government to set up a higher standard of herd. These are the sources from which the Milk Marketing Board continues to supply this dangerous food to the community.

What must be done in the matter? I think it would pay the community many hundreds per cent. to take steps

to eradicate these small, inefficient herds and farms. If that could be done, there would be a superior quality of milk produced. I see no reason why the agricultural industry should have greater protection than the engineering industry, with which I am associated, or with any other industry concerned with the welfare of the community. But, under the law, the agricultural industry is permitted to put on to the market, day by day, this improper food, and the powers of medical officers of health are quite insufficient to deal with the problem. If this suggestion that I have made cannot be carried out, then I think it is clearly the duty of the Ministry and other responsible parties to make sure that the products of these farms should be intercepted and treated before they are consumed. That is a just proposition. I speak on behalf of some of the leading municipalities in the north of England, to whom this problem is becoming increasingly acute from every point of view. This milk ought to be pasteurised; if it cannot, then it certainly should be manufactured into dried milk, because the process of such manufacture frees it from all deleterious matter and dangerous germs. I believe it would be in the interests of the country if really serious efforts were directed to increasing the welfare of the general body of citizens. It is not unreasonable to suggest that we in Britain should follow the example of the United States, which gives a pure pasteurised milk supply to all its citizens throughout the different States of that great country. We know that in certain Continental countries, particularly Denmark and Norway, a similar state of affairs prevails, yet we in the heart of the Empire have not taken the steps which ought to be taken forthwith in this direction. Let it be said by the Minister that this is of as great concern to him, the Ministry and the Government as any other concern affecting the welfare and safety of the population. If that be so, then this Bill will be beneficial to the whole community."

The Secretary of State for Scotland (Mr. Ernest Brown) having made no reference to these points in replying for the Government, Mr. David Adams asked: Has the right hon. Gentleman nothing to say with regard to small farms as the prime source of tuberculosis? No reply was given.

The Bill was read a second time, and committed to a Committee of the Whole House.

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The following are among the questions and answers recorded in the House of Commons recently:—

Animals Injured through Enemy Attack

Home Secretary's Statement on the National A.R.P. for Animals Committee

Mr. Hannah asked the Home Secretary whether he can give any information in regard to arrangements made for dealing with domestic and food animals which may be injured as a result of enemy attack?

The Secretary of State for the Home Department (Sir J. Anderson): The National A.R.P. Animals Committee was constituted with the encouragement of my Department to deal with the welfare of animals under war conditions. With the co-operation of the veterinary profession and of animal welfare societies and their staffs the committee has established a voluntary organisation covering practically the whole country. At first its attention was concentrated on animals in towns, but the committee has now widened its scope to cover animals on farms and it has secured the full collaboration of the veterinary profession and the National Farmers' Union. Special arrangements have been made to deal with injured food animals, and it is part of the purpose of the organisation to protect the public from panic-stricken animals. The organisation has been established and equipped by voluntary contributions from the public and by advances from animal welfare societies, and it has the cordial support of my Department.

White Bread (Vitamin B_1)

Mr. Levy asked the Parliamentary Secretary to the Ministry of Food whether, seeing that it is an achievement on the part of British science, he is in the position to give the name or names of the British scientist or scientists whose research over a period of time has made it possible to add vitamin B_1 to white bread on a large and popular scale?

Mr. Boothby: Scientific research is international in character, and the synthesis and commercial production of vitamin B_1 owes much to the work of scientists in other countries. It is, however, to the credit of the British scientists who were consulted by the flour milling industry that they were the first to realise the possibility of an important contribution to the nutritional value of white bread being secured by the introduction of vitamin B_1 into white flour, and they conducted the extensive series of investigations required to test the technical methods and their commercial practicability.

Mr. Levy: While thanking my hon. Friend for his reply, is it not only fair that the scientists who, in the final result, have enabled this policy to be achieved should have their names publicly announced so that they can get the credit?

Mr. Boothby: It is always rather invidious to mention the names of scientists, because when that is done one always finds that there are others equally entitled to share in the credit.

Sir Francis Fremantle: Would it not be as well to wait until we see the results of this experiment?

. . . . .

Doctors: Protection of Practices

Mr. Groves asked the Minister of Health whether he will take powers to protect the private practices of medical practitioners serving with His Majesty's forces, having regard to the failure of the present scheme and the dissatisfaction which exists, as many absentee practitioners have only received a few shillings from private practices producing in the same period hundreds of pounds?

Mr. M. MacDonald: I see no sufficient ground on the information before me for adopting the hon. Member's suggestion.

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Manure Factory, Shepherd's Bush

Mr. Charles Brown asked the Minister of Health whether he is aware that the business of manure manufacturer is being carried on in Wood Lane, Shepherd's Bush, within the Metropolitan borough of Hammersmith, in close proximity to the bottling depot of the London Wholesale Dairies, Limited, which deals in normal times with 40 per cent. of the milk supply of London; that the manure so produced has been stated on oath by an eminent bacteriologist in recent proceedings to contain *B. coli* and streptococci of faecal origin in considerable quantities; and what steps he proposes to take to prevent the milk being contaminated?

The Parliamentary Secretary to the Ministry of Health (Miss Horsbrugh): My right hon. Friend is aware that the works of Hyganic Limited, are situate as described. He has no knowledge of the evidence which was tendered in the proceedings to which the hon. Member refers, but he is advised that the process does not constitute a danger to health and with the precautions in force is unlikely to contaminate the milk supply specified.

Mr. Brown: Does the hon. Lady think that it is necessary, even in war-time, that processes like this should be carried on in the midst of crowded populations, especially when they are prohibited by Act of Parliament?

Miss Horsbrugh: If the hon. Gentleman will look at my reply, he will see that my right hon. Friend has looked into this case, and as far as we can see there is no danger to health or to the milk supply, but if the hon. Gentleman can bring forward any further evidence, my right hon. Friend will be very glad to receive it.

Mr. Brown: I will send the hon. Lady the evidence I have been given.

National A.R.P. for Animals Committee

Reserve Petrol Ration

Arrangements have now been made for the provision of members of the Committee's technical branch (*i.e.*, veterinary surgeons and their animal service helpers and parish animal stewards using cars on Animal A.R.P. duties) with an "iron ration" of petrol coupons.

This procedure is designed to ensure that such members are not immobilised for lack of petrol in the event of an air raid or other sudden emergency. It is hoped that the occasion for using these coupons will not arise, and it is stressed that they may not be used until the individual member finds himself without petrol and without other coupons either basic or supplementary which he can present at a petrol filling station, and then only in the circumstances mentioned above.

These "iron rations" (six units) will be dated as being valid until December 31st, 1940, and will be issued to the N.A.R.P.A.C. Liaison Petroleum Officer in sealed envelopes. Sufficient envelopes for all members in the Divisional Petroleum Officer's area will be issued to the Liaison Officer, together with a reserve of 10 per cent. Before being handed to the members concerned, each envelope should be numbered in the space provided in the top right hand corner (*viz.*, Member's number.....) and it is suggested that this number should be the same as that on the member's identity card issued by the Committee.

In order to put this plan into execution the Divisional Petroleum Officer must be supplied with the total number of members with cars in his area and this information should be sent to the N.A.R.P.A.C. Liaison Petroleum Officer for that area so that he may inform the D.P.O. of the total requirements. All veterinary officers are, therefore, requested to send immediately to their own Liaison Officer a list of their personnel (with addresses) who own cars which are to be used in an emergency. These sealed envelopes will then be issued to each member as rapidly as possible.

In the event of an envelope being opened the member concerned should immediately report by letter the circumstances to his N.A.R.P.A.C. Liaison Petroleum Officer, who will at once issue a renewal envelope from his reserve.

Where it becomes necessary to open an envelope and the whole of the six units has not been used, the member should return to the N.A.R.P.A.C. Liaison Petroleum Officer the envelope together with any unused coupons, when the Liaison Officer should immediately issue a further sealed envelope containing six units.

Members are required, as heretofore, to make applications direct to the Divisional Petroleum Officer for their normal supplementary allowance including that being utilised for N.A.R.P.A.C. work of organisation. The "iron rations" can only be used to tide them over an emergency period as described above.

In the event of a member ceasing to participate in the scheme the sealed envelope already issued to him should be recovered and returned unopened to the Divisional Petroleum Officer.

The Petroleum areas and the corresponding N.A.R.P.A.C. Liaison Petroleum Officers are as follows:—

Area.	N.A.R.P.A.C. Liaison Petroleum Officers.
Northumberland, Durham, North Riding of Yorkshire	W. Lyle Stewart, M.R.C.V.S., King's College, Newcastle-on-Tyne.
County of York less the North Riding of Yorkshire	S. L. Hignett, Esq., B.SC., M.R.C.V.S., Dept. of Agriculture, The University, Leeds
Soke of Peterborough, Nottingham, Lincoln, Rutland, Northampton, Leicester and Derby less the areas of Borough of Glossop, and New Mills and Whaley Bridge Urban District Councils, Borough of Buxton and Chapel-en-le-Frith Rural District Council	W. J. Ironside, M.R.C.V.S., M.P.S., Midland Agricultural College, Sutton Bonington.
Norfolk, Suffolk, Cambridge, Isle of Ely, Huntingdon, Bedford, Herts and Essex less that part of the Metropolitan Police Area lying within the two latter counties	Professor T. Dalling, M.A., M.R.C.V.S., Institute of Animal Pathology, Milton Road, Cambridge.
Kent, Sussex, London, Middlesex, Essex, Herts, Surrey including the part of the Metropolitan Police Area lying within the three latter counties	Dr. W. R. Wooldridge, M.SC., M.R.C.V.S, 36, Gordon Square, London, W.C.1.
Surrey (less that part of the Metropolitan Police area lying within that county), Hants (plus the areas of Poole Borough, Wimborne Minster Urban District and Wimborne and Cranborne Rural District), Berks, Oxford, Bucks, Isle of Wight	G. P. Male, Esq., M.R.C.V.S., 50, Friar Street, Reading.
Gloucester, Wilts, Dorset (excluding the areas of Poole Borough, Wimborne Minster Urban District and Wimborne and Cranborne Rural District), Somerset, Devon and Cornwall	D. W. Menzies, M.R.C.V.S., 22, Berkeley Square, Bristol.
Cardigan, Radnor, Brecknock, Monmouth, Glamorgan, Carmarthen and Pembroke	J. H. M. Hughes, M.R.C.V.S., Chief Meat Inspector, Roath Market, Cardiff.
Anglesey, Caernarvon, Merioneth, Montgomery, Denbigh and Flint	To be arranged.
Stafford, Warwick, Worcester, Hereford, and Shropshire	To be arranged.
Cumberland, Westmorland, Lancaster, Chester plus the area of the Borough of Glossop and New Mills and Whaley Bridge Urban District Councils, Borough of Buxton and Chapel-en-le-Frith Rural District Council	W. K. Johnstone, M.R.C.V.S., Tack Street, Water Street, Manchester.
Midlothian, East Lothian, West Lothian, Berwick, Roxburgh, Peebles, Selkirk, Dumfries, Fife, Kinross, Perth, Clackmannan	A. Gofton, F.R.C.V.S., Public Health Chambers, Johnstone Terrace, Edinburgh, 9.
Renfrew, Lanark, Argyll, Ayr, Bute, Dunbarton, Stirling, Kirkcudbright, Wigton	S. J. Abbott, M.R.C.V.S., 60, Melbourne Street, Glasgow.
Angus (Forfar), Aberdeen, Banff, Kincardine, Moray, Orkney, Shetland, Nairn, Inverness, Ross and Cromarty, Sutherland, Caithness	A. Spreull, D.S.O., T.D., M.R.C.V.S., 78, Ward Road, Dundee.

Delay in Issue of Equipment: An Appeal

The Issue Department of the National A.R.P. for Animals Committee has made a further request to the Government for wood with which to make crates to enable the issue of first aid boxes and other equipment to be carried out. Unfortunately, owing to the grave shortage of this material, no further allocation of wood can be made, and it therefore becomes imperative for veterinary officers to return without delay all crates sent to them containing material from N.A.R.P.A.C. Will they please return these crates immediately to the N.A.R.P.A.C. Officer, P.D.S.A. Sanatorium, Woodford Bridge Road, Ilford.

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Area Veterinary Controllers

As reported in our issue of July 6th, the grouping of certain counties under the supervision of Area Veterinary Controllers continues, with the object of facilitating the prosecution of the Rural Areas Scheme in full co-operation with branches of the National Farmers' Union and the Ministry of Food's local representatives. We are now pleased to announce that Mr. J. H. M. Hughes (Cardiff) has been appointed for the South Wales counties (Brecon, Cardigan, Carmarthen, Glamorgan, Monmouth and Pembroke) and Mr. J. C. Grant (Aberdeen) for those of the North of Scotland (Aberdeen, Angus, Banff, Caithness, Fife, Inverness, Moray, Perth, Ross, and Sutherland).

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Aug. 15th.—Meeting of Finance and General Purposes Committee, N.V.M.A., 11.30 a.m.; Survey Executive Committee, 2.30 p.m. Both at 36, Gordon Square, W.C.1.

Aug. 16th.—Full meeting of the Survey Committee, at 36, Gordon Square, W.C.1, 11.15 a.m.

Aug. 19th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

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PERSONAL

Appointment.—Mr. F. R. Bell, M.R.C.V.S., who graduated in July, has received appointment in the Colonial Veterinary Service as Veterinary Officer, Uganda.

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Birth.—Senior.—On August 4th, at Surbiton Hospital, to Barbara, wife of Victor E. Senior, M.R.C.V.S., of Kingston-on-Thames, a son.

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Marriage.—Cotchin—Goulburn.—On July 25th, 1940, at Ridgmont Baptist Chapel, Ernest Cotchin, M.R.C.V.S., to Marguerite Adelaide Goulburn, final year student, Royal Veterinary College.

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R.C.V.S. OBITUARY

Fryer, George Edward, Laithfield, High Welwyn, Herts. Graduated London, January 14th, 1885. Died July 25th, 1940; aged 76 years.

Mr. G. E. Fryer, M.R.C.V.S.

Mr. Fryer was a native of Kirkby Fleetham, near Bedale, Yorkshire, where he followed the tradition of four generations of his family by becoming a veterinary surgeon. He achieved a high reputation as an authority on lameness and his services as a consultant were in demand over a wide area. On his retirement in 1926 Mr. and Mrs. Fryer made their home in Welwyn.

The *Hertfordshire Mercury* says of him: "Mr. Fryer took an active part in the life of the church. Before coming to Welwyn he was churchwarden at Bedale for 25 years and soon after his arrival in Welwyn he succeeded the late Mr. J. J. Dodd as people's warden at St. Mary's Parish Church, and continued in that capacity until his death. He was also treasurer of St. Mary's, and did much work in looking after the finances of the church during the last few difficult years. He served for a time on the Welwyn Rural District Council, and was a member of the General Committee of the Queen Victoria Memorial Hospital. Mr. Fryer was a keen gardener, and he was very proud of his extensive rock gardens at his home. He laid out the rock garden at the Hospital, and was always ready to give assistance elsewhere.

"At the morning service on Sunday, Canon Griffith spoke of Mr. Fryer, whom he described as a striking example of a fine Christian gentleman. Much sympathy has been expressed to Mrs. Fryer in her sad bereavement."

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FOOT-AND-MOUTH DISEASE IN DEVON

The existence of foot-and-mouth disease was confirmed on Monday last amongst cattle and pigs at Oakford, Devon. The area subject to restrictions in the movement of animals lies within the counties of Devon and Somerset.

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A DESERVING DUAL-PURPOSE FUND

An appeal embracing both the limitless National need of the Red Cross and the scarcely less urgent requirements of the Benevolent Societies of the profession was launched in these columns a fortnight ago, by the Secretary of the Royal Veterinary College Medical Association. We are glad to learn that a good start has been made in both directions and that gold and silver medals are rapidly accruing for realisation. The proceeds, with cash donations, will go, in accordance with the expressed wish of the senders, to the Lord Mayor's Red Cross and St. John Fund, the Victoria Veterinary Benevolent Fund and the National Veterinary Benevolent and Mutual Defence Society.

Doubtless there remain many hundreds of medals bestowed by learned societies which this reminder may induce members of the profession to surrender in such a cause; those who have had their medals mounted or by whose relatives they are specially treasured are invited to send along a cash gift equivalent to their value. Gold and silver articles of any kind would also be welcomed: in this connection perhaps the ladies can see their way to help even more generously than by hunting out their husbands' hidden medals!

Mr. E. G. White, "The Beeches," Streatley, Berks, will acknowledge all contributions received and we shall be glad to publish a list of donors in due course. The Fund is devoid of expenses and its value at such a time will be evident to all.

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DISPOSAL OF LIVESTOCK ON REQUISITIONED FARMS

The following joint announcement is made by the Ministry of Food and by the Ministry of Agriculture and Fisheries:—

In certain areas, military operations may necessitate occupation by the Army authorities of a farm—or part of a farm—rendering necessary the removal of any livestock. In such cases the farmer should, if possible, make his own arrangements for removing his livestock. Where advice or assistance is required, and in all cases where farms are under disease restrictions, the farmer should get into touch with the appropriate County War Agricultural Executive Committee. These committees have received detailed instructions regarding dispersal of stock in such circumstances and are in touch with the local officers of the Ministry of Food in regard to purchase by that Ministry of all stock fit for slaughter.

In the case of farms or areas subject to disease restrictions, the following arrangements will apply:—

Foot-and-Mouth Restricted Areas.—Where evacuation of farms within two miles of the infected place is necessary, the stock will be slaughtered.

Farms under restriction for Sheep Scab.—Sheep will be consigned direct to the slaughterhouse (except in certain special cases).

Swine Fever Restrictions.—Stock from farms under these restrictions will be consigned to the nearest slaughterhouse.

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FUTURE OF RACING

The Stewards of the Jockey Club announced in the edition of the *Racing Calendar* issued on August 1st, that they had been in touch with the Departments of the Government concerned and that they were hopeful that a limited programme would be allowed from about the middle of September. There has been no racing in this country since the Wolverhampton Meeting was concluded at Dunstall Park on June 18th. Since then a large number of horses then in training has been turned out or destroyed.

The Stewards of the National Hunt Committee also announced in the *Calendar* that they had been in touch with the Ministry of Home Security and that they were hopeful that it would be possible for a moderate amount of racing to be held under National Hunt Rules during the autumn and winter, it being understood that circumstances might cause the abandonment of racing at any time. This intimation has been given at the present time in order that owners and trainers shall have time to make such arrangements as they may wish as regards the getting up and training of their horses.

* * * * *

THE JOURNAL OF PATHOLOGY AND BACTERIOLOGY

With the May issue, the *Journal of Pathology and Bacteriology* completed its fiftieth volume. "Founded in 1892 by the late Prof. Sims Woodhead, it has consistently maintained its position as an authoritative journal of British pathology, and much of the best work in pathological and bacteriological research of British investigators has appeared in its pages," states *Nature* (July 13th). "Commendation must be expressed with regard to paper and type, and the excellent illustrations have always been a feature. The present number which, in spite of war-time restrictions, maintains the high standard of its predecessors, contains 13 papers covering a wide range of subjects in human and animal pathology, bacteriology, chemotherapy and other topics, together with some shorter articles and book reviews."

This journal is now becoming more and more a medium in which articles of first-class importance to the veterinary scientist are being published, and since the publication of the *Journal of Comparative Pathology and Therapeutics* has been suspended for the duration of the war, it is likely that veterinary research workers will now have recourse increasingly to publication of their articles in it. Care should be taken, however, that by publication in a medium such as this, the purport of the articles is not lost to the ordinary veterinary reader, and we shall be glad to get reprints of articles published in outside journals of this kind from authors, for notice in our abstract columns.

* * * * *

ANIMAL DISEASES RESEARCH ASSOCIATION

Director's Summary of Work in Progress During the Past Year

The following is a summary of the work in progress at Moredun Institute, Gilmerton, Edinburgh, given by the Director, Dr. J. Russell Greig, at the Annual General Meeting of the Animal Diseases Research Association on July 24th, 1940.

Louping-Ill.—In regard to louping-ill, there has been carried out a large-scale field experiment involving the use of 22,000 sheep for the purpose of determining whether the vaccine prepared by the method of tissue culture in the laboratory was of equal value to that prepared from tissues derived from artificially infected sheep.

The new method is not only less costly and less laborious, but obviates the destruction of several hundred sheep, which procedure has hitherto been necessary in the preparation of each annual issue of vaccine—a very important matter, particularly at the present time. The results of the field tests were very satisfactory in that they showed that the "new type" vaccine afforded a degree of protection equal to that of the "old." It should, however, be said that further work is necessary in order to ensure that the "new type" vaccine, when prepared on a commercial basis, can be relied upon to maintain its efficiency. This work for some time past has been actively in progress.

During the year approximately 133,000 doses of louping-ill vaccine were issued.

Braxy.—Braxy vaccine has been issued for several years as a "single dose" vaccine and continues to prove highly effective as a means of controlling the disease. Approximately 71,000 doses of braxy vaccine were issued this year. I would, however, take this opportunity of again emphasising that on farms on which braxy is particularly virulent the vaccination may with advantage be repeated after an interval of 14 days.

Lamb Dysentery.—Approximately 82,300 doses of lamb dysentery serum were issued this spring and it is satisfactory to report that the product again appears to have proved highly effective.

White Scour in Calves.—The investigations carried out during the past three years have afforded evidence that calves born from cows whose colostrum is deficient in vitamin A are predisposed to white scour; whereas calves receiving colostrum rich in vitamin A are relatively insusceptible to the disease. There was, therefore, presented the problem of maintaining a high level of vitamin A in the colostrum of cows stall-fed during the winter. The investigations showed that the feeding of carotene-containing substances such as carrots failed to raise the vitamin A content of the colostrum. This was also true in respect of the feeding of substances such as cod liver oil which contained vitamin A itself. It would, therefore, now appear that there is little likelihood that the treatment of the pregnant cow by these methods is a practicable measure for the prevention of white scour in calves. On the other hand we have evidence that the administration of vitamin A to the newly-born calf promises to afford a practicable means of prevention and it is proposed to investigate this matter further as soon as opportunity occurs.

Pine.—In 1930 we were able to show that a disease of young cattle and sheep known in Scotland as pine was closely similar to if not identical with a disease in New Zealand named "bush sickness," in that, apart from other considerations, both conditions could be prevented and cured by the administration of crude iron compounds. Later investigations by Australasian workers afforded evidence that "bush sickness" is in fact due to a deficiency of cobalt. It may reasonably be inferred that the beneficial effects of iron compounds were due to the fact that they contained minute quantities of cobalt as an impurity. We have now obtained experimental evidence that pine, in so far at least as it affects certain parts of Scotland, can be treated specifically by cobalt alone. In conjunction with the Macaulay Institute for Soil Research, Aberdeen, experiments are proceeding to determine whether the addition of cobalt to artificial manures will so raise the cobalt content of soil and pasture that such manurial treatment can effectively convert pining pastures into healthy pastures. The experiments are not as yet complete but I can say that, so far, they have given very encouraging results and should this method prove effective it should also prove a cheap and comparatively easy way of eradicating the disease in pining areas.

Pulpy Kidney Disease.—Severe losses in lambs are

each year experienced from pulpy kidney disease. This affection attacks lambs during the first few weeks after birth and is due to a micro-organism closely related to that causing lamb dysentery. This year a field station was established in Perthshire and field experiments involving some 10,000 lambs have been in progress for the purpose of developing a means of preventing the disease in the lamb by the vaccination of the pregnant ewe.

Scrapie.—As I have reported on previous occasions, we have now obtained evidence that scrapie in sheep is an infective disease which can be transmitted artificially by inoculation, congenitally from the ram or the ewe to the progeny and also through the medium of the pasture. The incubative period of the disease is prolonged. In view of this evidence an experimental hirsel was purchased over two years ago and is being maintained for the purpose of studying the cause and nature of the disease. Because of the long incubative period of scrapie the investigation must necessarily be a lengthy one, but the results already obtained have afforded evidence which represents a very real advance in our knowledge of the cause and nature of the disease.

Grass Sickness.—The problem of grass sickness in horses still remains obcure. I have had to make this statement over a number of years. I need not remind you of the money and the effort which have been expended by the staff of this Institute in collaboration with eminent authorities representing practically all the biological sciences. This year again, in spite of war conditions, the investigation of the problem has been actively prosecuted both in the field and in the laboratory. It is quite impossible, here, to describe in any adequate way the extent of the investigations, and the fact that they have almost consistently led to negative results is not to be regarded as altogether discouraging since these negative results in themselves have considerably extended our knowledge of the disease. Grass sickness will continue in the forefront of the Association's programme.

Predigested Straw.—At the request of the Agricultural Research Council the Institute is at present engaged in determining by direct calorimetric measurement the food value of so-called predigested straw for use as cattle fodder. This investigation, essentially a war measure, is at present taking first place in the work of the Biochemical Department.

The Institute is in close collaboration with the Agricultural Research Council's Committees on mastitis, on contagious abortion in cows and on sheep diseases in general including the important problem of tick control. It is, however, possible that because of the condition of war some curtailment of the work on these problems may be expected, but the Agricultural Research Council take the general view that where long-range research gives reasonable prospects of applicable results, such work should not be suspended during the war.

This year, as in former years, there has been carried out much work of a routine nature; over 200 reports on bacteriological and biochemical diagnosis have been issued to veterinary practitioners and stock owners. While such work occupies much time I believe it constitutes a valuable service to agriculture.

* * * * *

HOME-GROWN VEGETABLE DRUGS

The need to budget for uninterrupted supplies of those vegetable drugs which have been obtained, hitherto, principally from European countries now closed to commerce with the United Kingdom is receiving the close attention of the Ministry of Health. Consultations have been held between the Ministry and owners of English herb farms to find out the potential output of medicinal plants required for the manufacture of preparations commonly prescribed in hospitals and in National Health Insurance and general medical practice. Representatives of drug manufacturing houses and large consuming interests have also been consulted.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

MAGGOTS—THEIR EFFECTS ON WOUNDS AND TUMOURS

To the Editor of the Veterinary Record

Sir,—Apropos the maggot treatment of wounds, *vide* p. 543 of your issue of the 27th ult., I consider that the healing effect of maggots on wounds has been exaggerated. As far as animals are concerned, we have made trials on the healing of wounds and chronic ulcers in the tropics by adopting different methods such as the maggot treatment, the use of antiseptics, and surgical measures. In many types of chronic ulcer, the maggot healing has been a success to a certain extent, followed in the last stages by antiseptics or what are commonly called healing lotions, ointment or balm. With the type of ulcer termed summer sores of horses, probably due to the larvae of Habronema (Spiroptera), we give preference to the surgical treatment, followed by antiseptics. With ordinary wounds the usual antiseptic treatment alone gives by far the most successful results, the more so if the always willing maggots have not taken the lead around some vital parts such as the eye, ear or mouth—the latter a favourite place in newly-born calves and foals in the tropics.

When we come to the treatment of tumours the maggot treatment for removal has been proved the most successful, especially in certain regions of the body where the surgeon would hesitate to use the scalpel. Here is where the maggots become famous as surgeons. This is nothing new; in fact it has been in vogue in the wilds of Venezuela since time immemorial, especially by the Indians. I mention this because we are apt to claim as our modern discoveries the work of people whom some would call savages. These are the people who discovered in Ecuador that Cinchona-bark from a tree which the Indians called "Quina-quina" could cure malarial fevers. Medicine was well advanced among the Aztecs of Mexico and the Incas of Peru, previous to the advent of the Spaniards, who destroyed all the records they could obtain, and brought American medicine once and for all under European influence.

Yours faithfully,
Edward Morgan.

"De Lejos,"
Crest Road,
Hayes, Kent.
August 3rd, 1940.

* * * * *

THE "ELECTRICAL COAXER"

To the Editor of the Veterinary Record

Sir,—I am grateful to Mr. Edward Wilkinson for his information and illustration of the electrical coaxer. The methods up to the present used largely in this country to get a cow up have often seemed to me capable of improvement from an ethical and humane point of view. I hope a source of supply other than German will be found.

Yours faithfully,
G. Mayall.

Bolton.
August 3rd, 1940.

[Mr. J. F. D. Tutt, F.R.C.V.S., of Winchester, forwards an illustration and details of the "Hot Shot Prod" produced by the Norden Laboratories, of Lincoln, Nebraska. He writes, "I rather doubt if it is possible to import it, but if it is, and it lives up to its name, not a few of us would welcome it."]

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